Enterprise Computing Innovations, Skills and Career Opportunities

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Information Technology
State of the Art, Circa 1960s
Accelerating Advances in Technology

Source: Kurzweil 1999 – Moravec 1998
Accelerating Advances in Technology
Driving Costs Steadily Downward

Source: Kurzweil 1999 – Moravec 1998
Today’s Overarching Realities
21st Century Drivers of Change

Network Ubiquity
More than a billion Internet users and three billion wireless subscribers worldwide

The Rising Tide of Globalization
Economics, Expertise, Openness

Innovation
Combining technology with insight to create new value

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Network Ubiquity
Everyone and Everything is Connected

A million businesses
A billion people
A trillion devices
The Globally Integrated Enterprise…
… Business Without Borders …
Driven by the Globally Integrated Economy
The Changing Nature and Scope of Innovation

Open
Collaborative

Product and Services Innovation
Process Innovation
Business Model Innovation
Management System Innovation
Societal Innovation

Multi-disciplinary
Global
### National Innovation Initiative

<table>
<thead>
<tr>
<th>Talent</th>
<th>Investment</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Develop a diverse, world-class, next-generation of innovators</td>
<td>- Help markets place top value on long-term innovation strategies</td>
<td>- Create world-class infrastructures, including transportation, information, healthcare and energy</td>
</tr>
<tr>
<td>- Establish a National Innovation Prize</td>
<td>- Establish incentives to increase early-stage investment in small-business innovation</td>
<td>- Drive regulatory and legal systems to better support innovation and entrepreneurship</td>
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<tr>
<td>- Make the US a magnet for the best global talent</td>
<td>- Invest to accelerate innovation in the services economy</td>
<td>- Build a system that protects the rewards of IP, but that also encourages open collaboration</td>
</tr>
</tbody>
</table>

Establish innovation metrics for the knowledge economy, not the industrial economy.
Established Innovation Ecosystems

Positioning to Compete in the Global Economy

NII Initiatives Launched

NII Initiatives Formulating
Global Innovation Outlook

Identifying and Acting on Major Issues Affecting Business and Global Society

GIO 1.0  Healthcare, Government, Work/Life Balance
GIO 2.0  Future of the Enterprise, Environment, Transportation
GIO 3.0  Media & Content, Africa
GIO 4.0  Security & Society, Water & Oceans

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Global Innovation Outlook

Key Findings

- Open, multi-disciplinary, global collaboration enables growth opportunities
- Leveraging intellectual capital is more important than protecting intellectual property
- Without dramatic change, it is unlikely that institutions of higher learning will keep pace with the dynamic nature of work
Commission on the Future of Higher Education

Led by U.S. Secretary of Education Margaret Spellings

- Develop a national strategy for post-secondary education
  - Meet the needs of America’s diverse population
  - Address economic and workforce needs

- Preserve America’s lead in preparing students for the high-skilled, high-value jobs of the future
“Government and institutional policies created during a different era are impeding the expansion of models designed to meet the nation’s workforce needs”
Recognizing the Need for Services Innovation

*World’s Largest Labor Forces*

*A = Agriculture, G = Goods, S = Services*

<table>
<thead>
<tr>
<th>Nation</th>
<th>% WW Labor</th>
<th>% A</th>
<th>% G</th>
<th>% S</th>
<th>Approx. 25 yr % growth in services</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>25.6</td>
<td>43</td>
<td>25</td>
<td>32</td>
<td>191</td>
</tr>
<tr>
<td>India</td>
<td>16.5</td>
<td>60</td>
<td>12</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td><strong>USA</strong></td>
<td><strong>4.9</strong></td>
<td><strong>2</strong></td>
<td><strong>20</strong></td>
<td><strong>78</strong></td>
<td><strong>21</strong></td>
</tr>
<tr>
<td>Indonesia</td>
<td>3.5</td>
<td>43</td>
<td>18</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.2</td>
<td>20</td>
<td>14</td>
<td>66</td>
<td>20</td>
</tr>
<tr>
<td>Russia</td>
<td>2.4</td>
<td>11</td>
<td>29</td>
<td>60</td>
<td>38</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2.2</td>
<td>63</td>
<td>11</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>Japan</td>
<td>2.1</td>
<td>5</td>
<td>28</td>
<td>68</td>
<td>40</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1.6</td>
<td>70</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
</tbody>
</table>

Service sector employment is growing rapidly in both developed and developing nations.

Sources: 2008 CIA World Fact Book, Historical Trend Data from 2004 IBM Study.
The 21st Century Demands Uniquely-Skilled People

- Cross-disciplinary programs and degrees
- Fusing technical competency with industry-specific knowledge and business-process expertise
- Success requires open collaboration among academia, government and industry
Investment in Services Innovation

- Services Science, Management and Engineering (SSME)
  - Collaboration among Academia, Industry and Government to drive services innovation in the 21st century
  - Designing University curricula to tightly link technical and business disciplines

- Leading universities exploring and investing in SSME
  - Working in tandem with thought leaders in the business world
Developing T-Shaped People

Economics and Social Sciences
Business Anthropology
Organizational Change & Learning
Business and Management

Science and Engineering
Industrial and Systems Engineering
Computer Science & Info. Systems
Math and Operations Research
Building a Smarter Planet
To Address the World’s Most Pressing Issues

Landmark: Revolutionizes petroleum frontier exploration in Texas by integrating data sources to increase the likelihood of finding profitable sources of oil.¹

Stockholm, Sweden: An intelligent toll system in the city center resulted in 20% less traffic, 40% lower emissions and 40,000 additional users of the public transportation system.¹

River and Estuary Observatory Network: Will create the first technology-based real-time environmental monitoring and forecasting network to guide better policy, management and education for the Hudson River and estuaries worldwide.²

British Airways: Uses mobile device check-in and other self-service technologies to help facilitate a trouble-free travel experience and save the airline $3.50 per passenger.²
The Energy and Utility industry will change more in the next 20 years than it has in the last 100.

The decisions made in the next 5 years will determine whether the transition is considered a success.
Jam Participation Highlights

- Nearly 2,000 university faculty, students, select clients and business partners, and IBM business leaders and technologists
- Participants represented over 200 universities and research centers in 40 countries around the globe

**Jam Forums:**
- Smart Cities
- Smart Grid
- Smarter Healthcare
- Smarter Skills & Education
- Smart Water Management & Green Planet

- Summary report to be published by June 30
Smart Cities Insights & Ideas for Innovation from Jammers

- Characteristics of Smart Cities
  - They are places where ‘Collective Intelligence’ is enabled – the wisdom of both crowds & individuals
  - They are adaptable
  - They allow people to live healthy and fulfilling lifestyles
  - They sound and feel more like the natural environment

- Needs of Smart Cities
  - City-wide Wi-Fi networks
  - Thin clients
  - Easier multi-modal navigation via integrated mass transportation systems
  - “Walkable” metrics for a city (e.g. walkability, breathability, self-sufficiency)

- Ideas for Innovation for Smart Cities
  - Use of gaming, Augmented Reality, & 3D worlds to involve citizens in planning the futures of their cities
  - Mixed systems for local transport vehicles (solar, electric, other alternative energy sources)
  - Smart evacuation systems
Moving Forward

- Move quickly to capitalize on new innovation or risk commoditization
- Business, government and academia must partner more aggressively
- The capacity for change is the most essential attribute of leadership
“If nothing changes, nothing changes.”
**New Intelligence:**
A smarter planet gives organizations the vision to see without being there.

**Matiq:** Employs RFID tags to trace meat and poultry from the farm to store shelves to ensure safety and freshness and provide more transparency to consumers.¹

**German supermarket:** Uses smart RFID labels to manage inventory with real-time sales data, improving product availability and enhancing the consumer experience.²

**U.S. power company:** Saves $1.2 million annually by using an RFID-based fleet optimization system to reduce the amount of repair work on their vehicles.²

**IBM Deep Thunder:** Leverages computing power, visualization and data analytics to generate high-resolution weather forecasts for areas as fine as 1 to 2 square kilometers.³

¹ Approved Smart Planet Client References
² Smarter planet sales deck
³ Sam Palmisano speech, November 12, 2008
Green and Beyond: A smarter planet empowers organizations to do more, using less.

**Landmark:** Revolutionizes petroleum frontier exploration in Texas by integrating data sources to increase the likelihood of finding profitable sources of oil.¹

**StatoilHydro:** Links advanced real-time sensing capabilities in the field to collaborate and analyze resources across the enterprise for an expected 5% improvement in oil recovery.

**Stockholm, Sweden:** An intelligent toll system in the city center resulted in 20% less traffic, 40% lower emissions and 40,000 additional users of the public transportation system.¹

**IBM’s Carbon Tradeoff Modeler:** Manages and performs analytics to help companies reduce emissions and make smarter, more cost-effective energy choices.²

¹ Approved Smart Planet Client References
² Smarter planet sales deck
Smart Work:
A smarter planet puts organizations in position to be first and be right.

**Canadian airlines:** Use passenger information to predict the number of no-shows for each flight, so they can strategically overbook while minimizing the risk of bumping passengers.¹

**Max Bahr:** A Dynamic Inventory Optimization Solution enables the retailer to meet demand for any of 40,000 products in more than 80 outlets with low replenishment and storage costs—boosting customer service ratings to 99%.²

**British Airways:** Uses mobile device check-in and other self-service technologies to help facilitate a trouble-free travel experience and save the airline $3.50 per passenger.²

**IBM Research Zurich Lab:** Uses visualization software to render a 3D model of each patient, allowing doctors to interact with data that improves patient care.²

¹ Smarter planet sales deck
² Approved Smarter Planet Client References
Building a smarter planet

Dynamic Infrastructure:
A smarter planet enables organizations to solve the problem before the problem.

**British banks:** Utilize real-time data analytics of complex financial models to help understand and manage their exposure to risk.\(^1\)

**River and Estuary Observatory Network:** Will create the first technology-based real-time environmental monitoring and forecasting network to guide better policy, management and education for the Hudson River and estuaries worldwide.\(^2\)

**Bank of Montreal:** Created a synchronized secondary data center 100 kilometers from its primary facility to meet government regulations and ensure the safety and availability of data in the event of a disaster.\(^2\)

**IBM Fire Program Analysis:** Uses unique mathematical algorithms to determine where wildfires will likely occur, and helps optimize government funds and resources for battling those fires.\(^1\)

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1 Original deck
2 Approved Smart Planet Client References

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New Intelligence:
A smarter planet gives organizations the vision to see without being there.

Ste. Justine Hospital Research Center: Created a continually updated reservoir of clinical and genomic information to accelerate research while cutting administrative costs by 75%.

Nationwide Insurance: Used virtualization to streamline IT processes, achieving 85-90% server utilization and an anticipated $15 million cost savings over three years.

Elie Tahari: Boosted intelligence and competitive advantage by integrating order, sales, inventory and financial data with retailer and Internet-based demographic information.

IMPIRE AG: Faster data management, integration and analysis has led to 15% annual revenue growth, 10% market share growth in Germany and 40% market share growth in Austria and Switzerland.
Green and Beyond:
A smarter planet empowers organizations to do more, using less.

**On Line do Brasil:** Used energy-efficient servers to expand its data center operations while cutting management time by 30%. The company expects a full return on investment in as few as three months.¹

**Natural England:** Implemented an evidence-based carbon measurement and management system to help achieve a 50% reduction in carbon emissions by 2010.¹

**Energie Baden-Württemberg:** Offers residential customers smart appliances and meters that enable them to adjust electricity consumption based on price—reducing waste and easing peak loads.¹

**Centrinet:** Created an environmentally-conscious data center solution and hosting service that has helped reduce electricity usage by approximately 60%.¹

¹ Approved Smart Planet Client References
**Smart Work:**
A smarter planet puts organizations in position to be first and be right.

**Geisinger Health System:** Integrates real-time clinical data with medical history information to create a massive storehouse of intelligence that will assist doctors in delivering care.¹

**Canadian bank:** Software architecture examines thousands of sources of information in real time to capitalize on constantly changing market conditions.²

**Metabasis Therapeutics:** Highly-accurate, first-of-a-kind simulation software significantly lowers drug discovery time and costs by eliminating 80% of the compounds to be synthesized and tested in the lab.¹

**Professional Provident Society:** Developed a modular application infrastructure that unified disparate policy systems, enabling rapid product development at 50% lower costs.¹

¹ Approved Smart Planet Client References
² Smart planet deck for IBMers on ThinkForward
Dynamic Infrastructure: A smarter planet enables organizations to solve the problem before the problem.

**Moosejaw Mountaineering:** Created a seamless, interactive community shopping experience across the Web, stores and mobile devices to enhance customer loyalty and advocacy.¹

**UBench International:** Uses in-car wireless telemetry to automate the auto leasing process from end to end, cutting per-vehicle administrative costs by 35% while increasing customer satisfaction and retention.¹

**Yansha:** Dynamic supply chain management and enterprise resource planning cut order lead time from 2.5 days to 4.5 hours and improved order acknowledgement from 80% to 99%.¹

¹ Approved Smart Planet Client References